

Heights of rivers referred to zeros of gages—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Flint River.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Albany, Ga.....	80	20	4.1	31	0.5	16-18	1.4	3.6
<i>Chattahoochee River.</i>								
West Point, Ga.....	289	20	5.9	28	2.1	10-16	2.9	3.8
<i>Coosa River.</i>								
Rome, Ga.....	225	30	8.0	22	2.7	24	2.4	5.3
Gadsden, Ala.....	144	18	7.0	20	0.2	16-20	1.6	6.8
<i>Alabama River.</i>								
Montgomery, Ala.....	265	35	16.0	25	0.9	17-19	4.3	15.1
Selma, Ala.....	212	35	17.0	26, 27	0.6	19-20	4.8	16.4
<i>Tombigbee River.</i>								
Columbus, Miss.....	238	33	0.9	29	-8.0	{15-17 10-12 19, 20 }	-2.1	3.9

Heights of rivers referred to zeros of gages—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Tombigbee River—Con.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Demopolis, Ala.....	155	35	12.1	29	-2.7	20, 21	-0.1	14.8
<i>Black Warrior River.</i>								
Tuscaloosa, Ala.....	90	38	9.5	29	-0.7	15-20	1.5	10.2
<i>Columbia River.</i>								
Umatilla, Oreg.....	270	25	23.6	1	16.5	31	20.5	7.1
The Dalles, Oreg.....	166	40	40.4	2, 3	27.3	31	38.5	13.1
<i>Willamette River.</i>								
Albany, Oreg.....	99	20	5.0	1	2.2	31	3.8	2.8
Portland, Oreg.....	10	15	23.4	8	15.5	31	20.3	7.9
<i>Sacramento River.</i>								
Red Bluff, Cal.....	241	23	0.8	1	-0.8	30, 31	-0.1	1.6
Sacramento, Cal.....	70	25	11.8	1	8.6	31	9.8	3.2

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 80.4°, or 0.4° above normal; the highest was 103°, at Decatur on the 14th and at Goodwater and Wetumpka on the 16th, and the lowest, 52°, at Gadsden on the 2d. The average precipitation was 6.76, or 1.51 above normal; the greatest monthly amount, 13.42, occurred at Montgomery, and the least, 3.05, at Riverton.—*F. P. Chaffee.*

Arizona.—The mean temperature was 83.7°, or slightly below normal; the highest was 122°, at Fort Mohave on the 25th, and the lowest, 40°, at Fort Apache on the 23d. The average precipitation was 2.39, or 0.38 above normal; the greatest monthly amount, 8.04, occurred at Fort Huachuca, and the least, trace, at a number of stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 79.0°, or 1.1° below normal; the highest was 100°, occurring at several stations on different dates, and the lowest, 52°, at Keesees Ferry and Witts Springs on the 10th. The average precipitation was 5.14, or 1.97 above normal; the greatest monthly amount, 10.12, occurred at Lonoke, and the least, 0.97, at Warren.—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 234 stations, so that equal areas have about the same weight, was 77.9°, or 1.1° below the normal for the State, as determined from 202 records; the highest was 123°, at Volcano Springs on the 2d, and the lowest, 25°, at Bodie on the 31st. The average precipitation for the State, as determined by the records of 300 stations, was trace; the deficiency, as indicated by reports from 202 stations which have normals, was 0.04 of an inch; the greatest monthly precipitation was 1.00, at Needles, while none fell at many stations.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 66.7°, or 1.3° below normal; the highest was 105°, at Lamar on the 5th, and the lowest, 29°, at Troutvale on the 5th. The average precipitation was 3.01, or 0.71 above normal; the greatest monthly amount, 7.06, occurred at Santa Clara, and the least, 0.18, at Grand Junction.—*F. H. Brandenburg.*

Florida.—The mean temperature was 80.9°, or about normal; the highest was 102°, at De Funiak Springs on the 18th, and the lowest, 61°, at Wausau on the 3d. The average precipitation was 8.88, or 2.28 above normal; the greatest monthly amount, 24.45, occurred at Manatee, and the least, 3.21, at Tallahassee.—*A. J. Mitchell.*

Georgia.—The mean temperature was 80.2°, or about normal; the highest was 106°, at Albany on the 17th, and the lowest, 50°, at Clayton on the 2d. The average precipitation was 4.53, or 1.34 below normal; the greatest monthly amount, 8.05, occurred at Tallapoosa, and the least, 1.88, at Camak.—*J. B. Marbury.*

Idaho.—The mean temperature was 68.2°, or 1.8° above normal; the highest was 111°, at Hagerman on the 18th, and the lowest, 26°, at Swan Valley on the 1st. The average precipitation was 0.35, or 0.38 below normal; the greatest monthly amount, 1.36, occurred at Burnside, while none fell at Idaho City.—*S. M. Blandford.*

Illinois.—The mean temperature was 75.3°, or about normal; the highest was 101°, at Alexander on the 26th, and the lowest, 40°, at Chemung and Lanark on the 30th. The average precipitation was 3.74,

or 0.20 above normal; the greatest monthly amount, 9.84, occurred at Equality, and the least, 0.71, at Charleston.—*C. E. Linney.*

Indiana.—The mean temperature was 75.0°, or about normal; the highest was 101°, at Fairmount on the 23d, and the lowest, 42°, at Columbia City, Hector, and Salem on the 9th. The average precipitation was 3.28, or 0.15 above normal; the greatest monthly amount, 6.00, occurred at Scottsburg, and the least, 0.55, at Vevay.—*C. F. R. Wapenhans.*

Iowa.—The mean temperature was 73.1°, or about normal; the highest was 101°, at De Soto on the 23d, and the lowest, 38°, at Mason City on the 30th. The average precipitation was 3.07, or about 0.50 below normal; the greatest monthly amount, 8.66, occurred at Lenox, and the least, 0.42, at Whitten.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 76.2°, or 1.8° below normal; the highest was 106°, at Ulysses on the 7th, and the lowest, 45°, at Fanning on the 8th. The average precipitation was 5.32, or 1.70 above normal; the greatest monthly amount, 11.44, occurred at Independence, and the least, 1.21, at Medicine Lodge.—*T. B. Jennings.*

Kentucky.—The mean temperature was 77.3°, or about normal; the highest was 100°, at Princeton and Shelbyville on the 15th, at Paducah and Williamsburg on the 16th, and at Bardstown on the 17th; the lowest, 47°, at Loretto on the 10th. The average precipitation was 3.78, or 0.72 below normal; the greatest monthly amount, 7.41, occurred at Russellville, and the least, 0.97, at Lexington.—*H. B. Hersey.*

Louisiana.—The mean temperature was 82.7°, or 0.6° above normal; the highest was 105°, at Liberty Hill on the 31st, and the lowest, 54°, at North Louisiana Experiment Station, Calhoun, on the 5th. The average precipitation was 3.54, or 1.94 below normal; the greatest monthly amount, 7.30, occurred at Sugar Experiment Station, and the least, 0.37, at Minden.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 76.2°, or about normal; the highest was 100°, at Boettcherville, Boonsboro, and Hancock, Md., on the 23d, and the lowest, 37°, at Deepark, Md., on the 2d. The average precipitation was 4.23, or 0.07 below normal; the greatest monthly amount, 8.37, occurred at Seaford, Del., and the least, 0.92, at Smithsburg, Md.—*F. J. Wale.*

Michigan.—The mean temperature was 68.4°, or 1.2° below normal; the highest was 100°, at Battle Creek on the 24th, and the lowest, 30°, at Rockland on the 31st. The average precipitation was 3.62, or 1.12 above normal; the greatest monthly amount, 10.62, occurred at Big Rapids, and the least, 0.80, at Newberry.—*C. F. Schneider.*

Minnesota.—The mean temperature was 70.2°, or about normal; the highest was 100°, at Milaca on the 12th and at Beardsley on the 19th, and the lowest, 36°, at Tower on the 16th, at Mount Iron on the 29th, and at Roseau on the 30th. The average precipitation was 2.84, or about 0.50 below normal; the greatest monthly amount, 9.63, occurred at New Folden, and the least, 0.47, at New Ulm.—*T. S. Outram.*

Mississippi.—The mean temperature was 81.3°, or about normal; the highest was 103°, at Westpoint on the 14th, 17th, and 18th, and the lowest, 52°, at Okolona on the 31st. The average precipitation was 4.89, or about 1.00 above normal; the greatest monthly amount, 10.49, occurred at Batesville, and the least, 1.72, at Briers.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 76.1°, or about 1.0° below normal; the highest was 102°, at Princeton on the 25th and at Vichy on the 27th, and the lowest, 43°, at Potosi on the 1st. The average precipitation was 4.66, or slightly above normal; the greatest monthly amount, 9.39, occurred at Conception, and the least, 1.69, at Springfield.—*G. J. O'Connor.*

Montana.—The mean temperature was 66.7°, or 0.2° above normal;

the highest was 103°, at Glendive on the 17th, and the lowest, 28°, at Adel on the 1st. The average precipitation was 1.34, or 0.10 above normal; the greatest monthly amount, 5.42, occurred at Glendive, and the least, trace, at Billings.—*H. J. Glass.*

Nebraska.—The mean temperature was 73.4°, or 1.3° below normal; the highest was 106°, at Imperial and Madrid on the 25th, and the lowest, 36°, at Kennedy on the 28th. The average precipitation was 2.87, or 0.53 below normal; the greatest monthly amount, 10.85, occurred at Salem, and the least, 0.04, at Cody.—*G. A. Loveland.*

Nevada.—The mean temperature was 72.6°, or about 1.5° above normal; the highest was 110°, at Mill City on the 17th, and the lowest, 34°, at Elko on the 3d. The average precipitation was 0.14, or 0.25 below normal; the greatest monthly amount, 0.61, occurred at Ely, while none fell at several stations. Drought conditions prevailed over the State during the entire month. The ranges in most districts were seriously affected and stock had a hard struggle for existence.—*J. H. Smith.*

New England.—The mean temperature was 69.1°, or about normal; the highest was 101°, at Claremont, N. H., on the 4th, and the lowest, 33°, at Grafton, N. H., on the 1st. The average precipitation was 4.67, or normal; the greatest monthly amount, 8.84, occurred at Pittsfield, Mass., and the least, 1.99, at Nantucket, Mass.—*J. W. Smith.*

New Jersey.—The mean temperature was 74.7°, or about 2.0° above normal; the highest was 98°, at several stations on different dates, and the lowest, 38°, at Charlotteburg on the 1st. The average precipitation was 5.75, or 1.47 above normal; the greatest monthly amount, 9.02, occurred at Bridgeton, and the least, 3.34, at Cape May City.—*E. W. McGann.*

New Mexico.—The mean temperature was 73.0°, or 0.7° below normal; the highest was 106°, at Eddy on the 24th, and the lowest, 29°, at Winsors on the 12th. The average precipitation was 4.11, or 1.22 above normal; the greatest monthly amount, 10.51, occurred at Clayton, and the least, 1.00, at Eddy.—*R. M. Hardinge.*

New York.—The mean temperature was 70.3°, or 0.5° above normal; the highest was 101°, at Cedar Hill on the 3d, and the lowest, 35°, at Bolivar and New Lisbon on the 1st and at Saranac Lake on the 20th. The average precipitation was 3.72, or 0.17 below normal; the greatest monthly amount, 10.49, occurred at Port Jervis, and the least, 0.70, at Madison Barracks.—*R. G. Allen.*

North Carolina.—The mean temperature was 76.5°, or 1.0° below normal; the highest was 102°, at Rockingham and Salisbury on the 16th, and the lowest, 40°, at Linnville on the 1st. The average precipitation was 6.51, or 0.90 above normal; the greatest monthly amount, 12.15, occurred at Selma, and the least, 2.12, at Marion.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 68.3°, or 0.4° below normal; the highest was 109°, at Steele on the 21st, and the lowest, 32°, at Dunseith, on the 29th. The average precipitation was 1.88, or 0.49 below normal; the greatest monthly amount, 6.12, occurred at Sheyenne, and the least, 0.45, at Bismarck.—*B. H. Bronson.*

Ohio.—The mean temperature was 74.1°, or about normal; the highest was 105°, at Seaman on the 4th, and the lowest, 41°, at Orangeville on the 10th. The average precipitation was 4.18, or 0.22 above normal; the greatest monthly amount, 6.45, occurred at Levering, and the least, 1.51, at Vanceburg.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 79.8°, or about normal; the highest was 106°, at Kemp on the 13th, and the lowest, 59°, at Beaver on the 1st and Kemp on the 12th. The average precipitation was 6.05, considerably above normal; the greatest monthly amount, 14.00, occurred at Fort Sill, and the least, 1.35, at Norman.—*H. L. Bull.*

Oregon.—The mean temperature was 66.1°, or about normal; the highest was 107°, at Pendleton on the 13th, and the lowest, 26°, at Silverlake on the 1st. The average precipitation was 0.15, or 0.34 below normal, the lowest on record for July; the greatest monthly amount, 1.15, occurred at Stafford, while no rain fell in several counties.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 72.3°, or 1.0° above normal; the highest was 101°, at Aqueduct on the 22d, and the lowest, 35°, at Dushore on the 1st. The average precipitation was 3.91, or nearly normal; the greatest monthly amount, 8.24, occurred at Seisholtzville, and the least, 1.53, at Lewisburg.—*T. F. Townsend.*

South Carolina.—The mean temperature was 80.0°, or about normal;

the highest was 105°, at Columbia, Greenwood, and Little Mountain on the 15th, and the lowest, 47°, at Holland on the 4th. The average precipitation was 4.03, or 1.99 below normal; the greatest monthly amount, 10.16, occurred at Temperance, and the least, 1.58, at Trenton.—*J. W. Bauer.*

South Dakota.—The mean temperature was 72.4°, or about normal; the highest was 111°, at Interior on the 23d, and the lowest, 32°, at Ashcroft on the 28th. The average precipitation was 2.02, or about 0.89 below normal; the greatest monthly amount, 6.83, occurred at Canton, and the least, 0.28, at Forestburg. The precipitation was excessive over portions of Bon Homme, Clay, Lincoln, Turner, and Union counties.—*S. W. Glenn.*

Tennessee.—The mean temperature was 77.5°, or about 1.0° above normal; the highest was 101°, at Dover on the 15th and 16th, and the lowest, 44°, at Silverlake on the 9th and 10th and at Erasmus on the 10th. The average precipitation was 4.53, or about normal; the greatest monthly amount, 7.58, occurred at Lafayette, and the least, 1.61, at Covington.—*H. C. Bate.*

Texas.—The mean temperature, determined by comparison of 42 stations distributed throughout the State, was 0.6° below the normal; there was a slight excess for the month in a few scattered localities and a general deficiency elsewhere; the highest was 110°, at Desdemonia on the 23d, and the lowest, 44°, at Marathon on the 10th. The average precipitation, determined by comparison of 48 stations distributed throughout the State, was 0.44 above the normal. There was a general excess ranging from 1.00 to 5.19 over west Texas, the Panhandle, the western portion of north Texas, the eastern portion of southwest Texas, and in Galveston, Brazoria, and Fort Bend counties, with the greatest at Wichita Falls. Over the other portions of the State there was a general deficiency, with the greatest over the eastern portion, where the deficit ranged from 1.00 to 2.00. The rainfall was very unevenly distributed over the State. The greatest monthly amount, 12.70, occurred at Alvin, while none fell at several stations.—*I. M. Cline.*

Utah.—The mean temperature was 73.3°, or 1.0° above normal; the highest was 107°, at St. George on the 1st and 27th, and the lowest, 30°, at Woodruff on the 23d. The average precipitation was 0.66, or 0.01 above normal; the greatest monthly amount, 3.07, occurred at Grover, and the least, trace, at Blue Creek, Croydon, and Ogden. On the evening of the 11th a flood, produced by heavy rain or a cloudburst in the mountains, swept down Manti Canyon, struck Manti, which is located at the foot of the canyon, and damaged buildings and other property to the extent of about \$25,000 or \$30,000.—*L. H. Murdoch.*

Virginia.—The mean temperature was 75.7°, or about 1.0° above normal; the highest was 101°, at Doswell on the 22d, and the lowest, 35°, at Hot Springs on the 10th. The average precipitation was 4.48, or slightly in excess of the normal; the greatest monthly amount, 10.41, occurred at Sunbeam, and the least, 1.42, at Clifton Forge.—*E. A. Evans.*

Washington.—The mean temperature, was 66.1°, or about 1.5° above normal; the highest was 112°, at Lindon on the 16th, and the lowest, 32°, at Colfax on the 23d. The average precipitation was 0.36, or 0.26 below normal, or about 58 per cent of the normal amount; the greatest monthly amount, 1.59, occurred at Coupeville, while none fell at Centerville, Connell, Lyle, and Sunnyside.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 73.3°, or 0.6° above normal; the highest was 100°, at Uppertract on the 22d, and the lowest, 33°, at Terra Alta on the 10th. The average precipitation was 3.78, or 0.89 below normal; the greatest monthly amount, 7.92, occurred at Philippi, and the least, 0.20, at Beckly.—*C. M. Strong.*

Wisconsin.—The mean temperature was 70.3°, or nearly normal; the highest was 102°, at Medford on the 25th, and the lowest, 34°, at the same station on the 30th. The average precipitation was 3.19, or 0.13 above normal; the greatest monthly amount, 7.60, occurred at Gratiot, and the least, 0.75, at Medford.—*W. M. Wilson.*

Wyoming.—The mean temperature was 65.6°, or 1.0° below normal; the highest was 108°, at Bittercreek on the 25th, and the lowest, 28°, at Rock Springs on the 3d and at Burns on the 23d and 29th. The average precipitation was 1.28, or slightly above normal; the greatest monthly amount, 3.28, occurred at Cheyenne, and the least, 0.07, at Wamsutter.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

COLD WAVES IN THE SOUTHWEST.

J. S. HAZEN, Observer, Weather Bureau.

The remarkable, intense, and far-reaching cold waves of the past winter, culminating in that phenomenal and record-breaking cold wave of February 11-14, 1899, gave lower temperatures in many sections than had ever been known, and has done much to bring the work of the Weather Bureau

before the people, and to give an impetus to the study of the phenomena attending such storms.

The local and visible conditions or premonitions preceding a cold wave in the Southwest are, with the possible exception of the relative humidity, uniform and well known. The first, and absolutely essential element, is an area of low barometric pressure in the Southwest. This low area may develop in the Southwest, or move down the eastern slope of the Rocky